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(54)【発明の名称】　洗浄乾燥方法及び洗浄乾燥装置

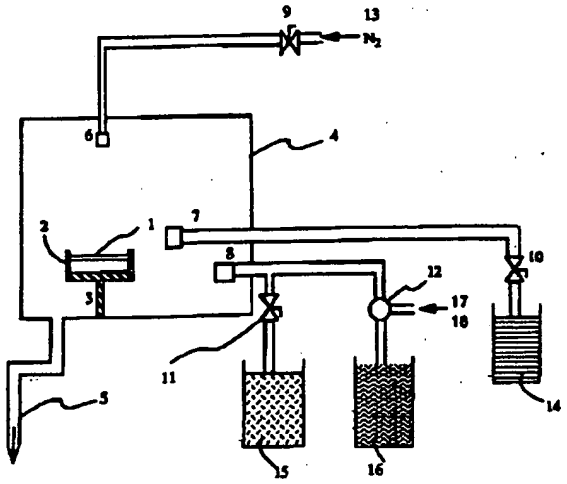
(57)【要約】

【目的】　枚葉処理において均一性が良く、ウォーターマークの防止に効果的な洗浄手段を提供する。

【構成】　半導体ウェハ１を傾きをつけて薬液へ入れ、液中で向きを変え、入れたときと反対側から取り出す。取り出す際にはN_2ガスを吹き付け薬液の除去効果を上げる。また半導体ウェハ１の薬液への出し入れ時にN_2ガスを吹き付け、薬液の蒸気からの影響を低減する。

【効果】　本発明を用いることにより枚葉一貫処理半導体ウェハの洗浄において、ウェハ面内の浸漬時間を等しくでき、かつ効果的な薬液除去を行える。

図1



いて

① 半導体基板を支持するステージを上下させ、薬液供給時に半導体基板を液面から十分離すことで飛散の影響を低減し、エッチングが不均一になることが避けられる。

【0009】② 半導体基板を傾斜を付けて液へ挿入し、液中で挿入時に対して液面法線方向に対称になるように変更し、そのまま液から取り出すことにより半導体基板内で処理時間を等しくでき、均一なエッチングができる。

【0010】③ 半導体基板を液から取り出す際ステージに傾斜を付け、かつ上方から液を落すようにN₂ガスまたは不活性ガスを吹き付けることにより短時間で薬液を除去できる。

【0011】④ 半導体基板を液中に挿入する時及び液から取り出す時に上方からN₂ガスまたは不活性ガスを吹き付けることにより液からの蒸気の影響を低減し、均一なエッチングができる。

【0012】⑤ N₂ガスまたは不活性ガスを吹き付けながら回転させ、乾燥を行うことにより、傾いたウェハへのガス吹き付けのみでは除去しきれない分を短時間で完全に除去することができる。

【0013】

【実施例】本発明の一実施例である装置の概要を図1に示す。半導体ウェハ1は図1のようにテフロン製の支持爪2でステージ3に固定される。このステージ3には薬液へのウェハ浸漬時や液からの取り出し時に高さを変える上下移動、ウェハの挿入時、浸漬中、取り出し時の角度を任意に変えるチルト動作、スピン乾燥させるときの回転動作などの機能を持たせた。薬液A15及び薬液B16はバルブ11、12を介してノズル8から洗浄槽4に供給される。さらに薬液A15及び薬液B16を洗浄槽4に供給するためのラインを洗浄、乾燥するためにバルブ12から純水17、N₂ガス18を供給できる。また純水14はバルブ10を通してノズル7から、N₂ガス13はバルブ9を通してノズル6から供給される。

【0014】次に図2～図6を用いて本発明による洗浄方法について説明する。まず洗浄槽4をN₂ガス13でパージした後、ウェハ1を入れる。そして図2のようにステージ3を水平に上昇させた状態で、バルブ11または12を開けて薬液A15またはB16を入れる。洗浄槽内の薬液17が十分な量になったら、図3のようにステージ3を傾けノズル6からN₂ガス13を吹き付けながら下降させ、ウェハ1を浸漬する。そして図4のように薬液中でウェハ1の向きを変える。処理終了後、この状態のままステージ3を上昇させる。このときステージ3の上昇速度は浸漬の際の下降速度と同一になるようにする。これら一連の操作によりウェハ面内の処理時間を一定にできる。次に図5のようにステージ3を上昇させる際バルブ9を開け、ノズル6からN₂ガス13を吹き付け、基板表面を液切れさせる。このN₂ガス13は薬液を巻き上げないように流量を調整する。次に図6のように十分な高さにステージ3を上昇させた後、ドレイン5から薬液の排水を行う。そしてバルブ10を開け、ノズル7から純水14を洗浄槽4に入れる。以下同様の手順でリンスを行い最後にN₂ガスまたは不活性ガスを吹き付けながらスピン乾燥させる。

【0015】なお本発明においてステージ3の操作は、実施例ではチャンバー底部からステージ3を支持する部分によって行われるが、上部にステージ支持部を設けても良い。また2種類の薬液を用いる場合は、最初の薬液を供給したあと次の薬液に移る前に、まずバルブ12から純水17を供給し、薬液供給ラインを洗浄する。その後N₂ガス18を導入し、乾燥を行ってから次の薬液を供給する。

【0016】

【発明の効果】本発明により枚葉一貫処理半導体ウェハの洗浄の、ウェハ面内均一性の改善すると共に乾燥に伴うウォーターマークを低減できる。

【図面の簡単な説明】

【図1】本発明による洗浄装置の概略図。

【図2】薬液の供給時のステージ3の状態を示す図。

【図3】薬液へのウェハ挿入時のステージ3の状態を示す図。

【図4】薬液中のステージ3の状態を示す図。

【図5】薬液からのウェハ取出し、乾燥方法を示す図。

【図6】純水供給時のステージ3の状態を示す図。

【符号の説明】

1…半導体ウェハ，2…半導体固定爪、3…回転ステージ、4…洗浄槽、5…ドレイン、6，7，8…ノズル、9，10，11，12…バルブ、13，18…N₂ガス、14，17…純水、15…薬液A、16…薬液B、19…洗浄槽内の薬液B、20…洗浄槽内の純水。

フロントページの続き

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* NOTICES *

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1] The schematic diagram of the washing station by this invention.
[Drawing 2] Drawing showing the state of the stage 3 at the time of supply of a medical fluid.
[Drawing 3] Drawing showing the state of the stage 3 at the time of the wafer insertion to a medical fluid.
[Drawing 4] Drawing showing the state of the stage 3 in a medical fluid.
[Drawing 5] Drawing showing wafer drawing from a medical fluid, and the dryness method.
[Drawing 6] Drawing showing the state of the stage 3 at the time of pure water supply.
[Description of Notations]
1 [— A rotation stage, 4 / — A washing tub, 5 / — A drain,, 6, 7, 8 / — A nozzle,, 9, 10, 11, 12 / — 13 A bulb, 18 / — 14 N2 gas, 17 / — Pure water, 15 / — A medical fluid A, 16 / — A medical fluid B, 19 / — The medical fluid B in a washing tub,, 20 / — Pure water in a washing tub.] — A semiconductor wafer, 2

[Translation done.]

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presser foot stitch tongue 2 made from Teflon like drawing 1 . Functions, such as tilt operation which changes the angle at the time of ejection arbitrarily, and rotation operation when carrying out spin dryness, were given to this stage 3 during being immersed at the time of insertion of vertical movement which changes height at the time of being wafer immersed [medical fluid] and the ejection from liquid, and a wafer. A medical fluid A15 and a medical fluid B16 are supplied to the washing tub 4 from a nozzle 8 through bulbs 11 and 12. In order to wash the line for furthermore supplying a medical fluid A15 and a medical fluid B16 to the washing tub 4 and to dry, pure water 17 and N2 gas 18 can be supplied from a bulb 12. Moreover, N2 gas 13 is supplied for pure water 14 by the nozzle 6 through a bulb 9 from a nozzle 7 through a bulb 10.

[0014] Next, the washing method by this invention is explained using drawing 2 – drawing 6 . A wafer 1 is put in after purging four byNwashing tub 2 gas 13 first. And where a stage 3 is horizontally raised like drawing 2 , bulbs 11 or 12 are opened and medical fluids A15 or B16 are put in. It is made to descend, leaning a stage 3 like drawing 3 and spraying N2 gas 13 from a nozzle 6, if the medical fluid 17 in a washing tub becomes sufficient amount, and a wafer 1 is immersed. And the sense of a wafer 1 is changed in a medical fluid like drawing 4 . A stage 3 is raised after a processing end with this state. It is made for the climbing speed of a stage 3 to become the same as that of the lowering speed in the case of being immersed at this time. The processing time within a wafer side can be fixed by operation of these series. Next, in case a stage 3 is raised like drawing 5 , a bulb 9 is opened, N2 gas 13 is sprayed from a nozzle 6, and the liquid piece of the substrate front face is carried out. This N2 gas 13 adjusts a flow rate so that a medical fluid may not be wound up. Next, after raising a stage 3 in sufficient height like drawing 6 , a medical fluid is drained from a drain 5. And a bulb 10 is opened and pure water 14 is put into the washing tub 4 from a nozzle 7. Spin dryness is carried out the same procedure as the following performing a rinse, and spraying N2 gas or inert gas finally.

[0015] In addition, although operation of a stage 3 is performed in the example in this invention by the portion which supports a stage 3 from a chamber bottom, you may form a stage supporter in the upper part. Moreover, before moving to the following medical fluid after supplying the first medical fluid when using two kinds of medical fluids, pure water 17 is first supplied from a bulb 12, and a medical fluid supply line is washed. N2 gas 18 is introduced after that, and since it dries, the following medical fluid is supplied.

[0016]

[Effect of the Invention] By this invention, while improving, the watermark accompanying dryness which is the homogeneity within a wafer side of washing of a sheet consistent processing semiconductor wafer can be reduced.

chamber of the processor of this invention consists of a stage which supports vertical movement, a tilt, and the wafer that can perform rotation operation, a nozzle which supplies a medical fluid, pure water, N2, etc., and a drain according to the content of processing.

[0007] In this invention, a semiconductor substrate is inserted in a penetrant remover so that a semiconductor substrate may have an inclination to an oil level using the vertical mechanism of the stage which fixes a semiconductor substrate, and a tilt feature. Blasting of N2 gas or inert gas is performed from the side which has not been flooded with a medical fluid at this time. And while processing a semiconductor substrate with a medical fluid, the inclination of a substrate is changed so that it may become symmetrical with the direction of an oil-level normal to the time of insertion, a stage is raised without changing the state, and a semiconductor substrate is taken out from a penetrant remover. At this time, to this semiconductor substrate, blasting of N2 gas or inert gas is performed so that liquid may be dropped. Spraying N2 gas or inert gas in the position distant from the oil level enough, after taking out a semiconductor substrate from a penetrant remover furthermore, a stage is rotated and it is made to dry. A pure water rinse and dryness are performed by the same method after that.

[0008]

[Function] The stage which supports a ** semiconductor substrate in washing of the semiconductor substrate in sheet processing and dryness is made to go up and down, the influence of scattering is reduced by separating a semiconductor substrate from an oil level enough at the time of medical fluid supply, and a bird clapper is unevenly avoided for etching.

[0009] ** An inclination is attached and a semiconductor substrate is inserted in liquid, it changes so that it may become symmetrical with the direction of an oil-level normal to the time of insertion in liquid, and by taking out from liquid as it is, the processing time can be made equal within a semiconductor substrate, and uniform etching can be performed.

[0010] ** A medical fluid is removable in a short time by spraying N2 gas or inert gas so that an inclination may be attached to a stage in case a semiconductor substrate is taken out from liquid, and liquid may be dropped from the upper part.

[0011] ** When inserting a semiconductor substrate into liquid, and when taking out from liquid, by spraying N2 gas or inert gas from the upper part, the influence of the steam from liquid is reduced and uniform etching can be performed.

[0012] ** A part to be unable to remove only by gas blasting to the leaning wafer is completely removable in a short time by making it rotate, spraying N2 gas or inert gas, and drying.

[0013]

[Example] The outline of the equipment which is one example of this invention is shown in drawing 1 . The semiconductor wafer 1 is fixed to a stage 3 by the support

two or more tubs which put them in one by one is general. On the other hand, in consideration of the contamination under a pace or conveyance, there is a 1 tub multi-stage method which processes by the one chamber. There are what applied spray washing to this method, a thing which makes the flow of a medical fluid in a washing tub. For details, it is introduced to semiconductor International (Semiconductor International) and the August, 1987 issue. After the former washes by spraying on a wafer the medical fluid made into the shape of Myst by N2 and purges the Myst completely, it carries out centrifugal dryness. The latter sends in a medical fluid from the bottom of the container into which the wafer cassette was put, and pours it in the container upper part. It washes by changing the medical fluid to pour, and a rinse is carried out to the last by hot pure water. It drains from a bottom after that and IPA (isopropyl alcohol) steam seasoning is performed. Each of two examples is batch processing above. Although batch processing is the present mainstream, diameter-ization of wafer macrostomia for cost reduction follows on progressing, and the gestalt of a washing station has also been improved in recent years. For washing latus area uniformly, examination with sheet processing advantageously sufficient but still is not performed.

[0003]

[Problem(s) to be Solved by the Invention] Although in the case of what applied spray washing in the above-mentioned conventional technology the medical fluid whose washing is possible is also little and ends for a short time, if Myst does not start a wafer uniformly, there is a problem that unevenness will arise in the medical fluid distribution within a field, and a cleaning effect will become uneven. Moreover, in order to make a medical fluid into the shape of Myst, time for a medical fluid to stay at a wafer is short, and time is unsuitable for a reaction to this thing.

[0004] Although there is an effect in probability reduction of particle contamination since the frequency in which an oil level crosses a wafer is reduced in the case of the method of making the flow of a medical fluid in a washing tub, generating of the watermark by the moisture in that there is much consumption of a medical fluid or IPA poses a problem. Moreover, when performing IPA steam seasoning, since there is risk, such as ignition and explosion, the cure is needed. In the case of the wafer of a diameter of macrostomia which is furthermore treated by sheet processing, realization is difficult for a means to lessen the amount of medical fluids to consume, and to carry out removal of a medical fluid or pure water to homogeneity from the whole wafer, and it inquires now.

[0005] It is in the purpose of this invention solving problems by survival of the medical fluid and pure water which were mentioned above, such as a watermark and the heterogeneity of etching, and offering further washing that can realize sheet-ized processing, the dryness method, and equipment.

[0006]

[Means for Solving the Problem] In order to attain the above-mentioned purpose, the

semiconductor substrate in a penetrant remover so that the front face of this semiconductor substrate may have an inclination to an oil level. The step which leans this semiconductor substrate so that it may become symmetrical with the direction of an oil-level normal to the time of insertion in a medical fluid. The step which takes out this semiconductor substrate from a penetrant remover in the state where the inclination of this semiconductor substrate becomes symmetrical with the direction of an oil-level normal to the time of insertion.

[Claim 3] The washing dryness method according to claim 2 characterized by performing blasting of N2 gas or inert gas to the above-mentioned semiconductor substrate in the step which takes out the above-mentioned semiconductor substrate from a penetrant remover.

[Claim 4] The washing dryness method according to claim 3 characterized by rotating the above-mentioned stage, spraying N2 gas or inert gas after taking out the above-mentioned semiconductor substrate from a penetrant remover.

[Translation done.]

no vapor/solvent

DETAILED DESCRIPTION

[Detailed Description of the Invention]

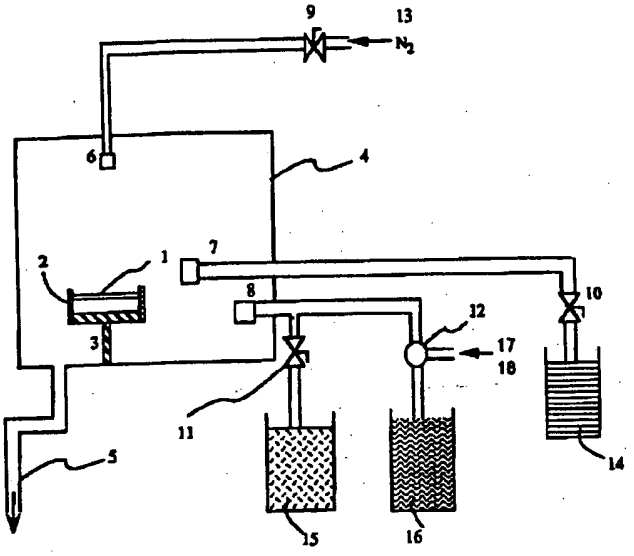
[0001]

[Industrial Application] this invention is sufficient pure environment about a semiconductor substrate, and relates to the washing dryness method which makes it possible to perform washing and dryness processing, and its equipment.

[0002]

[Description of the Prior Art] Now, R SHI A (RCA) washing devised by W.Kern and others as the washing method is in use. This method consists of SC-1 (mixed liquor of NH4OH, H2O2, and H2O), an HF solution, and three sorts of solution processings of SC-2 (mixed liquor of 1, HCH2O2, and H2O) fundamentally, and is explained in detail by the R SHI A review (RCA Review) Vo1.31 and No.187 (1970). Since many kinds of medical fluids are used, the multi-tub multi-stage method which moves the wafer to

図1



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CLAIMS

[Claim(s)]

[Claim 1] It is the washing dryer characterized by to include a means to by_which the means of the above-mentioned stage of operation moves up and down on the above-mentioned stage in the washing dryer which has a container, the semiconductor substrate fixed stage prepared in this container, the means of this stage of operation, and the medical fluid and the gas-supply nozzle for supplying a medical fluid and gas in this container, the means which carries out a tilt, and the means which carries out rotation operation.

[Claim 2] The washing dryness method characterized by providing the following. The step which fixes a semiconductor substrate to a stage. The step which inserts this

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Summary.

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(57) [Abstract]
[Objects of the Invention] In sheet processing, homogeneity is good and offers a washing means effective for prevention of a watermark.
[Elements of the Invention] It takes out from the time of giving an inclination, putting in the semiconductor wafer 1 to a medical fluid, and changing and putting in the sense in liquid, and an opposite side. In case it takes out, N2 gas is sprayed and the removal effect of a medical fluid is raised. Moreover, N2 gas is sprayed at the time of the receipts and payments to the medical fluid of the semiconductor wafer 1, and the influence from the steam of a medical fluid is reduced.
[Effect] By using this invention, in washing of a sheet consistent processing semiconductor wafer, immersing time within a wafer side can be made equal, and effective medical fluid removal can be performed.

[Translation done.]

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361 H .
F26B 21/14 9140-3L.
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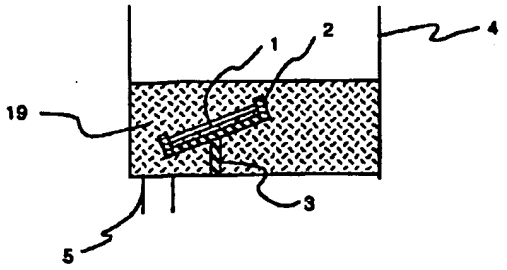
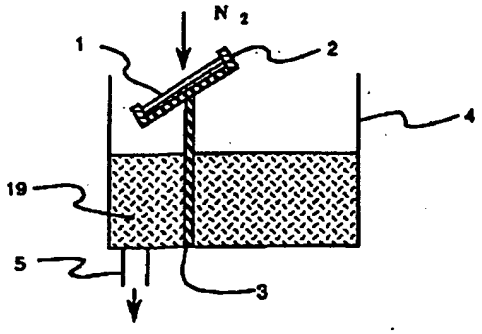
図4



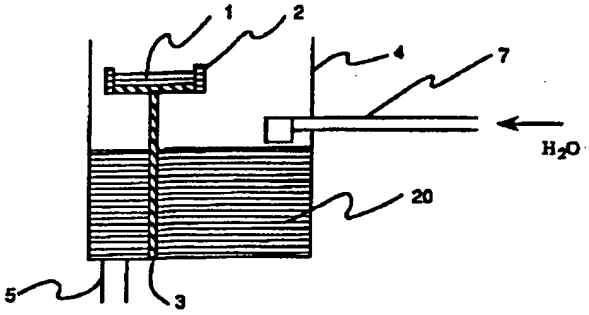
[Drawing 5]

図5



[Drawing 6]

図6



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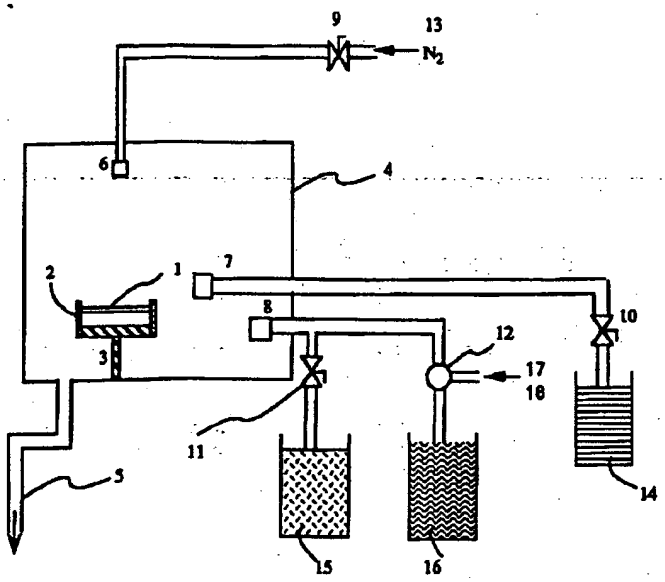
DRAWINGS

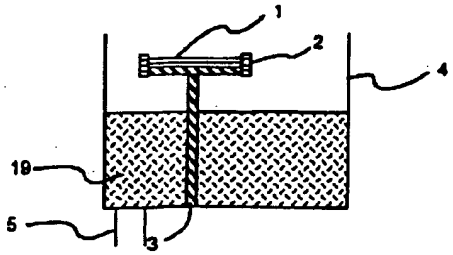
[Drawing 1]

図1



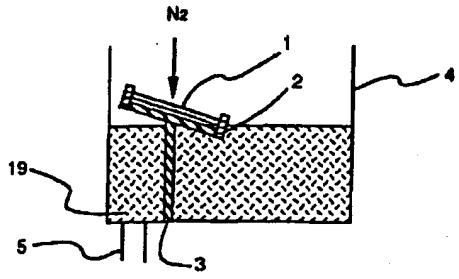
[Drawing 2]

図2



[Drawing 3]

図3



[Drawing 4]

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361 H
F26B 21/14 9140-3L.
[Request for Examination] Un-asking.
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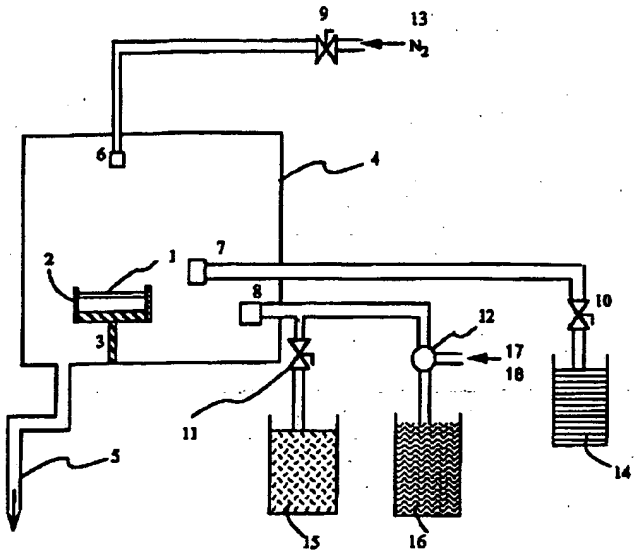
図1



[Translation done.]

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CLAIMS

[Claim(s)]

[Claim 1] It is the washing dryer characterized by to include a means to by_which the means of the above-mentioned stage of operation moves up and down on the above-mentioned stage in the washing dryer which has a container, the semiconductor substrate fixed stage prepared in this container, the means of this stage of operation, and the medical fluid and the gas-supply nozzle for supplying a medical fluid and gas in this container, the means which carries out a tilt, and the means which carries out rotation operation.

[Claim 2] The washing dryness method characterized by providing the following. The step which fixes a semiconductor substrate to a stage. The step which inserts this

two or more tubs which put them in one by one is general. On the other hand, in consideration of the contamination under a pace or conveyance, there is a 1 tub multi-stage method which processes by the one chamber. There are what applied spray washing to this method, a thing which makes the flow of a medical fluid in a washing tub. For details, it is introduced to semiconductor International (Semiconductor International) and the August, 1987 issue. After the former washes by spraying on a wafer the medical fluid made into the shape of Myst by N2 and purges the Myst completely, it carries out centrifugal dryness. The latter sends in a medical fluid from the bottom of the container into which the wafer cassette was put, and pours it in the container upper part. It washes by changing the medical fluid to pour, and a rinse is carried out to the last by hot pure water. It drains from a bottom after that and IPA (isopropyl alcohol) steam seasoning is performed. Each of two examples is batch processing above. Although batch processing is the present mainstream, diameter-ization of wafer macrostomia for cost reduction follows on progressing, and the gestalt of a washing station has also been improved in recent years. For washing latus area uniformly, examination with sheet processing advantageously sufficient but still is not performed.

[0003]

[Problem(s) to be Solved by the Invention] Although in the case of what applied spray washing in the above-mentioned conventional technology the medical fluid whose washing is possible is also little and ends for a short time, if Myst does not start a wafer uniformly, there is a problem that unevenness will arise in the medical fluid distribution within a field, and a cleaning effect will become uneven. Moreover, in order to make a medical fluid into the shape of Myst, time for a medical fluid to stay at a wafer is short, and time is unsuitable for a reaction to this thing.

[0004] Although there is an effect in probability reduction of particle contamination since the frequency in which an oil level crosses a wafer is reduced in the case of the method of making the flow of a medical fluid in a washing tub, generating of the watermark by the moisture in that there is much consumption of a medical fluid or IPA poses a problem. Moreover, when performing IPA steam seasoning, since there is risk, such as ignition and explosion, the cure is needed. In the case of the wafer of a diameter of macrostomia which is furthermore treated by sheet processing, realization is difficult for a means to lessen the amount of medical fluids to consume, and to carry out removal of a medical fluid or pure water to homogeneity from the whole wafer, and it inquires now.

[0005] It is in the purpose of this invention solving problems by survival of the medical fluid and pure water which were mentioned above, such as a watermark and the heterogeneity of etching, and offering further washing that can realize sheet-ized processing, the dryness method, and equipment.

[0006]

[Means for Solving the Problem] In order to attain the above-mentioned purpose, the

presser foot stitch tongue 2 made from Teflon like drawing 1 . Functions, such as tilt operation which changes the angle at the time of ejection arbitrarily, and rotation operation when carrying out spin dryness, were given to this stage 3 during being immersed at the time of insertion of vertical movement which changes height at the time of being wafer immersed [medical fluid] and the ejection from liquid, and a wafer. A medical fluid A15 and a medical fluid B16 are supplied to the washing tub 4 from a nozzle 8 through bulbs 11 and 12. In order to wash the line for furthermore supplying a medical fluid A15 and a medical fluid B16 to the washing tub 4 and to dry, pure water 17 and N2 gas 18 can be supplied from a bulb 12. Moreover, N2 gas 13 is supplied for pure water 14 by the nozzle 6 through a bulb 9 from a nozzle 7 through a bulb 10.

[0014] Next, the washing method by this invention is explained using drawing 2 - drawing 6 . A wafer 1 is put in after purging four byNwashing tub 2 gas 13 first. And where a stage 3 is horizontally raised like drawing 2 , bulbs 11 or 12 are opened and medical fluids A15 or B16 are put in. It is made to descend, leaning a stage 3 like drawing 3 and spraying N2 gas 13 from a nozzle 6, if the medical fluid 17 in a washing tub becomes sufficient amount, and a wafer 1 is immersed. And the sense of a wafer 1 is changed in a medical fluid like drawing 4 . A stage 3 is raised after a processing end with this state. It is made for the climbing speed of a stage 3 to become the same as that of the lowering speed in the case of being immersed at this time. The processing time within a wafer side can be fixed by operation of these series. Next, in case a stage 3 is raised like drawing 5 , a bulb 9 is opened, N2 gas 13 is sprayed from a nozzle 6, and the liquid piece of the substrate front face is carried out. This N2 gas 13 adjusts a flow rate so that a medical fluid may not be wound up. Next, after raising a stage 3 in sufficient height like drawing 6 , a medical fluid is drained from a drain 5. And a bulb 10 is opened and pure water 14 is put into the washing tub 4 from a nozzle 7. Spin dryness is carried out the same procedure as the following performing a rinse, and spraying N2 gas or inert gas finally.

[0015] In addition, although operation of a stage 3 is performed in the example in this invention by the portion which supports a stage 3 from a chamber bottom, you may form a stage supporter in the upper part. Moreover, before moving to the following medical fluid after supplying the first medical fluid when using two kinds of medical fluids, pure water 17 is first supplied from a bulb 12, and a medical fluid supply line is washed. N2 gas 18 is introduced after that, and since it dries, the following medical fluid is supplied.

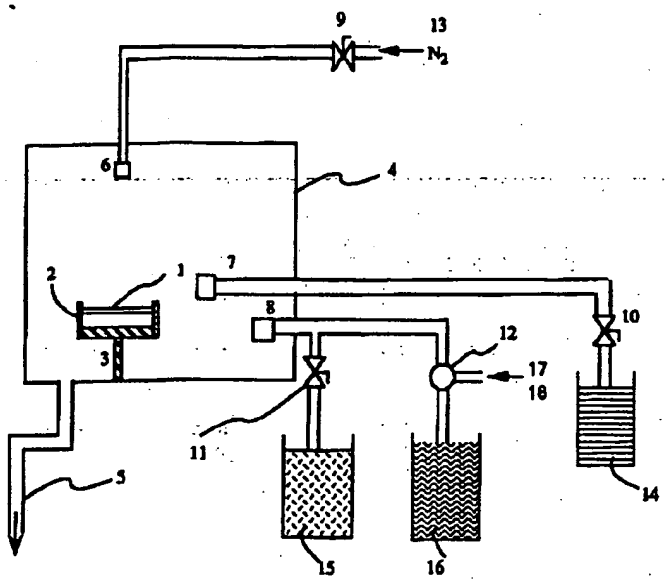
[0016]

[Effect of the Invention] By this invention, while improving, the watermark accompanying dryness which is the homogeneity within a wafer side of washing of a sheet consistent processing semiconductor wafer can be reduced.

DRAWINGS

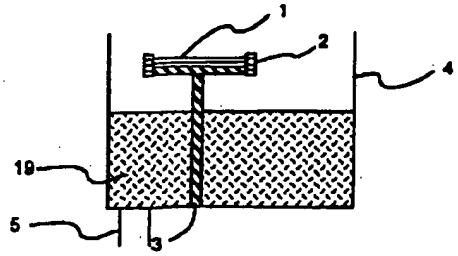
[Drawing 1]

図1



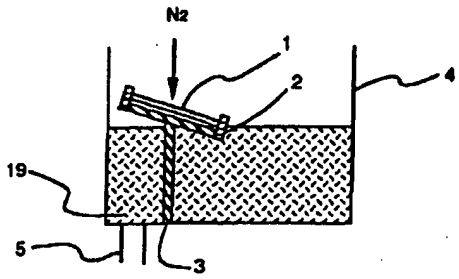
[Drawing 2]

図2



[Drawing 3]

図3



[Drawing 4]